

## REMARKS

This amendment responds to the Office Action mailed August 27, 2003. In the Office Action the Examiner:

- rejected claims 20-30 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention;
- rejected claims 1-2, 18-20, 31-32, 44 and 47 under 35 U.S.C. 102(b) as being anticipated by Daniel L. Swets et al., "Using Discriminant Eigenfeatures for Image Retrieval", IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 18, No. 8, pp 831-838, August 1996 (hereinafter Swets et al.);
- rejected claims 3-4, 21-22 and 33-34 under 35 U.S.C. 103(a) as being unpatentable over Swets et al. in view of Baback Moghaddam et al., "Probabilistic Visual Learning for Object Representation", IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 19, No. 7, pp 696-710, July 1997 (hereinafter Moghaddam et al.);
- rejected claim 48 under 35 U.S.C. 103(a) as being unpatentable over Swets et al. in view of P. Jonathan Phillips, "Support Vector Machines Applied to Face Recognition", Advances in Neural Information Processing Systems 11, M.J. Keans, S.A. Solla, and D.A. Chon, MIT Press, 1999 (hereinafter Phillips); and
- objected to claims 5-17, 35-43 and 45-46 as being dependent upon a rejected base claim, but indicated that they would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

After entry of this amendment, the pending claims are: claims 1-51.

### Claims 7-17, 23-30, 35-43 and 45-46 should be allowed

The Examiner indicated that claims 7-17, 35-43 and 45-46 are objected to as being dependent upon rejected base claims, but would be allowed if rewritten in independent form including all of the limitations of the base claim and any intervening claims. With this amendment, claims 7 and 35 have been rewritten in independent form including all of the limitations of the corresponding base claims 1 and 31 respectively. Meanwhile, claims 23-30 have been rewritten as claims directly or indirectly dependent upon claim 7. Therefore, claims 7-17, 23-30, 35-43 and 45-46 should be allowed.

The rejection under 35 U.S.C. 112, second paragraph, should be withdrawn

The Examiner has rejected claims 20-30 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. In response, Applicant has rewritten claims 20-26 as claims directly or indirectly dependent upon claim 1. Claim 19 has been rewritten in a similar fashion. Therefore, Applicant respectfully requests the rejection against claims 20-30 be withdrawn.

The rejection under 35 U.S.C. 102(b) should be withdrawn

Claim 1 recites a method for constructing a vector space in which a data sample relating to an object may be encoded. The first step of the method is to provide a raw matching score between each of a plurality of basis sample elements and each of a plurality of data samples in a first sample database. For example, as shown in the specification (page 9, lines 23-25 and step 330 of Fig. 3), there are two sets of data samples, samples  $B_1$  to  $B_{NB}$  in database  $DB_B$  and samples  $A_1$  to  $A_{NS}$  in database  $DB_S$ . The method generates a raw matching score  $S(A_i, B_j)$  for each pair of data samples,  $A_i$  from database  $DB_S$  and  $B_j$  from database  $DB_B$ . The second step of the method is to construct a vector space from the raw matching scores such that the vector space is defined by a basis set of sample space modes.

In contrast to Applicant's invention, Swets et al. does not teach or suggest a method of constructing a vector space that uses two sets of data samples. Instead, Swets et al. teaches a method for selecting from a training set of images those images that match a query image best using a new approach called *Discriminant Karhunen-Loeve (DKL) projection*.

The Swets approach first projects images in the training set to a first subspace defined by a first group of values derived from the training set, and then projects them to a second subspace defined by a second group of values derived from the training set. The first group of values are called the training set's *Most Expressive Features* (MEF) and the second group of values are called the training set's *Most Discriminating Features* (MDF). As illustrated in Figs. 1 and 3 of Swets et al, the MDF subspace has a higher capability than the MEF subspace to classify an input image that is considerably different from those images in the training set, because the classes in the MDF subspace have larger between-class distances and smaller within-class distances. Following the establishment of the MEF and MDF subspaces, the Swets approach projects the query image to the MDF subspace and then measures the distances between the query image and each training image in the MDF subspace. As a

result, the training images that are closest to the query image in the MDF subspace are regarded as the images that are most similar to the query image.

The Office Action suggests that the Examiner equates the query image to one of the samples in the plurality of data samples of claim 1, e.g., see the statement on page 3 of the Office Action “*an image query (data sample) is projected on each of a training set of images (basis or reference sample elements) in the MEF and MDF subspaces. ...*”. This is clearly inconsistent with the method recited in claim 1 because the method requires that a raw matching score be provided between each of a plurality of basis sample elements and each of the plurality of data samples. Moreover, without a plurality of data samples, it is impossible for the method taught by Swets et al. to have multiple raw matching scores and therefore a plurality of score vectors that are necessary for building a sample space as required by the second step of claim 1.

Since Swets et al. neither teaches nor suggests a plurality of data samples in a first sample database or how to build a sample space, claim 1 and its dependent claims 2 and 18-20 are not anticipated by Swets et al.

Claim 31 is a space construction and encoding system claim corresponding to claim 1. Therefore, claim 31 and its dependent claims 32, 44 and 47 are not anticipated by Swets et al. for at least the same reasons discussed above.

The rejection under 35 U.S.C. 103(a) should be withdrawn

To reject claims in an application under 35 U.S.C. § 103, the Examiner bears the initial burden of establishing a prima facie case of obviousness. *In re Bell*, 26 USPQ2d 1529, 1530 (Fed. Cir. 1993). In order to establish prima facie obviousness, the prior art, either alone or in combination, must teach or suggest each and every limitation of the rejected claims. See *In re Vaeck*, 20 USPQ2d 1438 (Fed. Cir. 1991); *In re Royka and Martin* 180 USPQ 580 (C.C.P.A. 1974); and *In re Wilson* 165 USPQ 494 (C.C.P.A. 1970). The teaching or suggestion to make the claimed invention, as well as the reasonable expectation of success, must come from the prior art, not Applicant's disclosure. *In re Vaeck, Id.* Otherwise, the prima facie obviousness is not established. In the present instance, the cited arts, either alone or in combination, do not teach or suggest each limitation of the rejected claims. Therefore, Applicant respectfully traverses the rejection.

As discussed above, Applicant's invention is directed to a method for constructing a vector space from raw matching scores between a plurality of basis sample elements and a

plurality of data samples. Even though Moghaddam et al. teaches a method of generating a rotation matrix, like Swets et al, it does not teach or suggest a method that calculates raw matching scores between two sets of data samples. Therefore, claim 3 and its dependent claims 4-6 and 21-22 are patentable over Swets et al in view of Moghaddam et al.

Claim 33 is a space construction and encoding system claim corresponding to claim 3. Therefore, claim 33 and its dependent claims 34 are also patentable over Swets et al in view of Moghaddam et al. for at least the same reasons discussed above.

Similarly, even though Phillips suggests a method that can be generalized to biometrics such as fingerprints, it does not teach or suggest a method that calculates raw matching scores between two sets of data samples. Therefore, claim 48 is patentable over Swets et al in view of Phillips.

In light of the above amendments and remarks, Applicant respectfully requests that the Examiner reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned attorney at 650-849-7777, if a telephone call could help resolve any remaining items.

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Respectfully submitted,

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